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ABSTRACT

This autoinstructional program deals with the ecology of a stream. It is suggested as a learning experience for low achievers in a high school biology program. Two behavioral objectives are suggested and the equipment needed is listed. The script has an accompanying worksheet for the student and a set of related questions to be answered. (EB)

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WATER POLLUTION

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TEACHER'S GUIDE

PACKET NUMBER	614.772 H
SUBJECT	Biology
TITLE	Water Pollution
LEVEL	Low - High School
GRADE	10
BEHAVIORAL OBJECTIVES	To list sources of water pollution when given a situation involving a creek. To discuss how nature cleans a stream and how man can interfere.
TIME	20 - 25 minutes
EQUIPMENT	Tape recorder Cassette tape 1971 EQ Index Poster - "The Ecology of a Stream" Worksheet on Water Pollution Worksheet on EQ Index
BIBLIOGRAPHY	The Ecology of a Stream, Du Pont Context 2/1972 to Vol. 1 No. 2 p 14 and 15 1971 EQ Index, National Wildlife Federation (Reprint) from Oct.-Nov. 1971 pp. 4-5

SCRIPT

WATER POLLUTION
BIOLOGY

Music

Hi! Today we're going to learn some things about water pollution. If we go to White Clay Creek we can find beer cans on the bottom and detergent scums on the surface. If we cross the Delaware Memorial Bridge we can see how discolored the water is with chemicals and grease slicks. If we go to Rehoboth in winter we can see all kinds of trash which the waves have brought upon shore. How did it all get that way? - It obviously didn't start that way. - Man did it.

Water is a very useful substance for man. In its pure form he relies on it for drinking in order to live. But man's other uses for water contaminate it and make much of the world's supply unfit for drinking unless it is treated. Such treatment often requires much time and money.

Look at the chart that appears before you showing the changes found in different parts of a stream as it moves along its course. It could easily represent White Clay Creek or any other stream or creek with which you are familiar. The circles show the types of organisms that are found at three different points along the stream. The first circle is the stream as it appears in the clear unpolluted area. The second circle, the untreated zone, is the area of the stream after the polluting sources. The third circle represents the recovery zone after the water has passed the treatment center and non-polluting areas. In

each circle one can see some examples of the animal life and plant life that can be found on the surface, swimming in the creek and crawling on the bottom. Turn off the tape and list all of the different kinds of organisms that can be found in each circle.

MUSIC

You should have noticed quite a difference in the number of organisms in the stream as it passed from the clear zone to the untreated septic zone. There were in fact fifteen organisms in the clear zone but only seven in the septic zone. On your answer sheet determine how many organisms appear common to both zones.

MUSIC

Your answer should be none. What happened to all the organisms that were found in the clean zone? Well, they were killed by the pollutants poured into the stream. When the stream was clear organisms living in it had a well balanced environment. There was enough oxygen dissolved in the water for all the animals present to breathe. The waste and decay produced by some organisms became the food for other organisms. Therefore the stream could cleanse itself as it moves along its course.

If man or another force interferes with the stream, it may lose its ability to cleanse itself. Look at the picture shown between the clear zone circle and the untreated zone circle. What factors are present here that may pollute the stream? List these on your answer sheet.

MUSIC

WATER POLLUTION
BIOLOGY

You should have listed the following. If not, add them to your list. The first pollutant that most people notice is the industry. Many companies need water from rivers and streams in order to run their business. When the water is pumped back into the stream it contains chemicals and wastes and may be several degrees warmer. The company needs the water in its original form but many companies do not care in which form the water is put back into the stream. For this reason environmentalists are trying to pass antipollution control laws which would require the companies to put the water back into the stream in the same condition in which they took it. This is not an impossible task but it does require the companies to spend some money on antipollution devices and of course many companies are not willing to spend this money.

A second cause of pollution is the city. The waste from the sewers may be dumped into the stream. If there is not an adequate treatment plant this waste may become a great pollution problem.

A third polluter in the picture is the cows. Their waste material is washed by the rains into the stream. Last of all the farmland pollutes. The rain also washes fertilizer and pesticides added to the crops into the stream. Many people do not think of farmland as land that has been changed by man. They seem to think of it as the natural state. The land in the natural form did not have cows - it

did not have crops with fertilizer or with pesticides to keep the crops growing. All of these things that have been added by man, add to the streams pollution problems. All of these factors contribute to changing the balance that nature had there. Nature's cycle for cleansing the stream cannot take into account those things that have been added by man.

Notice that in the polluted circle there are very few fish or insects. In a polluted stream the extra waste and fertilizer causes a great increase in the amount of algae that grows. As the algae decays more protozoans are produced which feed on the algae. These protozoans use up the oxygen which the fish would normally breathe. Therefore, the fish suffocate.

Streams have the ability to cleanse themselves if the pollution does not continue. In the picture of the recovery zone the stream winds through a wooded area with no farms, towns or industry. Here the chemicals added earlier become diluted, bacteria break up the waste materials and oxygen is added from the air to the stream. If the damage of the pollution has not been too great the stream may eventually return to its original form. Nature may be helped out by modern treatment plants but of course, the best solution is to prevent pollution in the first place.

Now compare the recovery zone with the other two circles. On your

answer sheet list those organisms which were in the clear zone that have now returned after the recovery. List also those common to both the untreated zone and the recovery zone. Turn the tape back on when you are done.

MUSIC

You should have found seven organisms common to both the clear and recovery zone. In fact all those found in the recovery zone are also found in the clear zone. The only organism not found in the clear zone that is in the recovery zone is the midge larva. It may be found however in the untreated septic zone. The stream therefore still has a ways to go until it reaches the original clear state. There are also some pollutants which nature cannot remove and which build in concentration to cause further problems. This is true of mercury and some insecticides such as DDT.

This A-T has been about a particular stream, but the problems are the same in all forms of water pollution. You can see how the problems would be greater for a pond since the H_2O would not move through a recovery zone but would be more apt to grow continually more polluted and stagnant. Perhaps you can think of an example of this in the Newark area. When you have completed this AT do the EQ Index on water on pages 4 and 5 and answer the worksheet questions. When you have finished rewind the tape and leave it as you found it.

WORKSHEET ON WATER POLLUTION

A.

CLEAR ZONE	UNTREATED SEPTIC ZONE	RECOVERY ZONE
1.	1.	1.
2.	2.	2.
3.	3.	3.
4.	4.	4.
5.	5.	5.
6.	6.	6.
7.	7.	7.
8.		8.
9.		
10.		
11.		
12.		
13.		
14.		
15.		

B. What organisms appear in both the clear zone and the untreated septic zone?

C. List below any factor present that may pollute the stream

1.

2.

3.

4.

D. What organisms appear in both the clear zone and the recovery zone?

WORKSHEET ON WATER POLLUTION

E. What organisms appear in both the untreated septic zone and the recovery zone?

WORKSHEET ON WATER EQ INDEX

1. List some reasons why there is reason to believe that our water pollution problems may be improving.

2. What per cent of the mercury discharge has been reduced?

3. What portion of the water used by industry is treated before it is released back into the stream?

4. What per cent of the U.S. city water systems do not produce acceptable water?

5. Who produces more water pollution - industries, agriculture or cities?

6. What per cent of the public water is not inspected each year?

7. How much will it cost to clean the water over five years?

8. Will Americans be able to get all the underground water they need in 1980?